Manual
BM-A1-E16SHD

16 Channel Digital Audio Monitor

User's Guide

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Introduction

The BM-A1-E16SHD is a 1U high-quality sixteen-channel video/audio monitor with multiple I/O as standard. The unit accepts audio from any one of four AES input pairs, eight analogue inputs or one of two SDI inputs and produces four pairs of AES outputs and eight analogue outputs. The SDI inputs automatically detect SD or HD or 3G video and de-multiplex all 16 audio channels. An active loop-through output is available for the SDI inputs.
The headphone output is taken before the limiters and mutes the speakers when used. Eight high-resolution tri-colour bargraphs are provided with user-selectable ballistics and colour break points. Up to sixteen PCM audio inputs can be selected individually or mixed and directed to each speaker.

Bargraph meters are arranged in two groups of eight, they can display 1 to 8 or 9 to 16 using the select button under the status display. Stick-on graticule scales, which may be applied to the spaces between the front-panel bargraphs, are supplied with the machine.

An integral Dolby decoder can accept Dolby Digital or Dolby E from any AES input pair or from any of the SDI embedded audio channel pairs. Dolby E is implemented using two operational modes; '*Independent*' where all eight channels are available and Dolby Mix-Down or '*Program*' mode where a selected mix of channels is available according to the encoding used. An example would be 5.1 +1 +1, where three 'programs' are available; the 5.1 mix down and the two additional programs, +1 and +1. In independent mode a 16 by 2 mixer allows any of the Dolby decoded channels to be fed to either or both audio output channels. This special mix-down facility allows a stereo version of a complete Dolby encoded signal to be heard for all programs. This is particularly helpful with Dolby E encoded signals where up to 8 audio signals of a surround sound + source can be heard using individual audio elements or a complete aural impression by summing some or all of the channels.

The eight audio channels are provided at the rear of the unit as four pairs of AES signals on BNC connectors and four pairs of differential analogue signals. The analogue outputs and line outputs can be at a fixed level or slaved to the front panel volume control. The analogue and two line outputs can be muted independently from the menu or under the control of the front panel mute switch.

Main features

- Four pairs of unbalanced (BNC) digital audio (AES) inputs, eight analogue line inputs
- Two auto-sensing SD/HD/3G inputs with loop-through
- Two groups of four tri-colour bargraphs
- Dolby® Digital or Dolby® E decoder
- Dolby mix-down program select switch
- Analogue line output and 8 analogue audio outputs, four pairs of AES outputs
- Headphone connector with speaker mute

Front panel rotary controls

Volume

The volume of the speaker and headphone output can be adjusted using this control. Pressing the end of the control will mute the speaker audio. This can also mute the line and analogue outputs.

Balance

This control will differentially adjust the level of the speaker and headphone output. Pressing the end of this control will centre the audio output.

Channel Pair select

This control will select which pair of audio inputs is applied to the Dolby decoder.

Dolby Mix

This control will set the way in which the monitor will treat the incoming audio. The **PCM** position will treat the current audio input as straight PCM encoding and reproduce it unprocessed on the 16 available channels.

The **IND** position will decode Dolby encoded information from the selected Dolby pair and produce 8 audio outputs. These can then be mixed as required.

The positions **1** to **8** will provide a stereo mixdown of the program's encoded in the Dolby input.

Menu

Pressing the end of this control will enter the menu mode described in the ***Menu*** section.

Input select

Rotating this control will select one of the four audio input sources; Analogue, AES, SDI1 or SDI2.

Operation

Selecting sources

The input source select switch determines which source (Analogue, AES, SDI 1 or SDI 2) is available to the speaker selectors and bargraphs. AES inputs can be at 44.1 kHz or 48 kHz sampling rate.

SDI input mode

The unit automatically detects SD, HD or 3G video. The four SDI groups will be demuxed to give 16 audio signals

Dolby mode

To enable the Dolby decoder, select the '*Independent*' or '*Program*' position using the front panel **DOLBY MIX** switch. The unit will decode Dolby Digital and Dolby E from the AES inputs or embedded audio carried in an SDI signal.

Dolby E encoding allows several separate 'programs' or groups of audio to be carried in the same data stream. The program switch is provided to allow the individual programs to be selected and their channels directed to bargraphs.

See the section entitled, ***Using the DOLBY MIX switch*** for more information about the Dolby E monitoring features available.

Decoding AES inputs

Rotate the **CHANNEL PAIR** switch to select the input carrying the Dolby encoded audio. The unit will automatically detect and decode the Dolby signals and display up to 8 audio signals on the bargraphs.

Decoding SDI inputs

Dolby E or Dolby Digital bit-streams embedded in a pair of audio signals in an SDI stream can be decoded with up to eight audio signals being shown on the bargraphs. The type of Dolby encoding used will be shown on the display.

Selecting the channel pair carrying the Dolby encoded signal is achieved using the **CHANNEL PAIR** rotary switch. For example, if the Dolby signal was encoded in the second pair of audio signals in SDI Group 1 this corresponds to channels 3/4 and is selected by rotating the **CHANNEL PAIR** select switch to position 3/4.

Using the DOLBY MIX switch

Dolby E encoding allows several separate 'programs' or groups of audio to be carried in the same data stream. The **DOLBY MIX** switch allows individual mix-downs and channels within a Dolby E program to be monitored. Available mix-downs are selected with the **DOLBY MIX** switch. The selected signal is sent to the left and right speakers and the first two bargraphs (left most looking at the front of the unit).

The following example may help to explain the facilities provided. Consider the situation where a studio wants to convey a surround sound music signal together with two technical commentaries for transmitter operators. For the surround sound component, a 5.1 configuration might be ideal since it has 5 audio channels and one LF effects channel. However, the two independent engineering feeds (two different languages and not for transmission) can be encoded into two unused channels to give a configuration of 5.1+1+1.

The Dolby mix-down

The operator at the transmitter might want to listen to the music but not necessarily in full surround sound. Fortunately, the Dolby decoder has an internal buss, which carries a mix-down. This is a stereo signal that contains a mixture of, in this case, all 6 music signals with any phasing or special effect applied. The Dolby decoder 'knows' that the audio is encoded as 5.1+1+1. In order to listen to the engineering feeds it must be possible to direct the decoder to select the 5.1, +1 or other +1 signals and output the appropriate mix-down to the buss. The three separately encoded audio 'programs' can be selected using the **DOLBY MIX** switch. Clearly the mix-down of the +1 signals will be a simple mono signal.
When the BM-AV1-E16SHD is in any of the P1 to P8 program select modes (or Dolby Down-Mix modes), the stereo audio available on the internal buss is sent to the left and right speakers and to bargraphs 1&2.

Independent mode

All of the Dolby E audio signals can be decoded and made available on their own (i.e., not mixed) by setting the **DOLBY MIX** switch to the independent position (**IND**).
In the 5.1 +1 +1 example, music might be presented on bargraphs 1 to 6 and the two engineering feeds on bars 7 and 8. It is then easy to select which of these to listen to by pressing the button under the appropriate bargraph. A mix down of some or all of the channels can be obtained by selecting several audio signals to be sent to each speaker.

Note: Independent mix-down does not apply all of the phasing effects of the Dolby mix down modes.

Directing sources to speakers

Where more than two audio signals are present it may be useful to direct and combine sources to selected speakers. The left speaker is indicated by a red LED and the right by a green LED on the top of the bargraphs.

To direct a particular source to the left or right speakers proceed as follows:
Repeatedly press the button under the bargraph corresponding to the input audio signal required until the top LEDs of the bargraph shows red for the left speaker, green for the right or both to direct the audio to both speakers. Each speaker can receive a mix of audio from inputs 1 to 16. Select either lower or upper 8 sources using the select button.

Note that the mix button assignments are retained over power-down.

Status display

The Status display will show general status information related to the currently selected input such as the source selected and video standard where applicable.

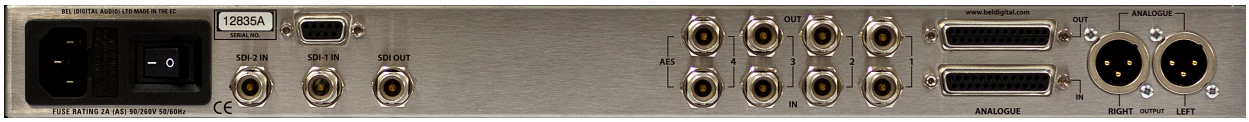
Rear panel inputs

The BM-A1-E16SHD accepts SDI video, AES and analogue audio inputs. Eight differential analogue inputs are provided on a 25 way 'D' type connector. Four pairs of AES unbalanced inputs are available on BNC connectors. Two SD, HD, 3G auto select SDI inputs are provided.

Rear panel outputs

The BM-A1-E16SHD provides both digital and analogue audio outputs on the rear panel. Eight differential analogue outputs on a 25 way 'D' type connector and four pairs of AES3 on BNC connectors are available. The audio carried on the AES outputs are derived from the currently selected input source (analogue, AES or SDI). In effect, these audio outputs are a copy of the signals shown on the unit's bargraphs. The analogue outputs are derived from the lower 8 inputs (ch1-8). They can thus be a copy of the AES inputs, or two of the currently demuxed SDI groups. Two line outputs are provided which carry the same audio as the speakers. The levels of the analogue and line outputs are adjustable in the menu. It is possible to mute the output from the unit's speakers by pressing the end of the **VOLUME** control. It is also possible to independently mute the analogue outputs and the line outputs using the volume control.

An SDI loop-through is available which carries a reconstituted SDI signal from the currently selected SDI input.



Menu

Many of the characteristics of the BM-A1-E16SHD can be adjusted in the menu. When the menu is activated, by pressing the **NAV** rotary encoder, the top level of the menu will appear. The items in this level can be selected by rotating the encoder and then pressing it for approximately 0.5 seconds. The second level will then appear and the required item selected by rotating the encoder and then pressing it. At this point in the menu the value of the current parameter can be adjusted. To go back one step in the menu press and hold the encoder for longer than 1 second.

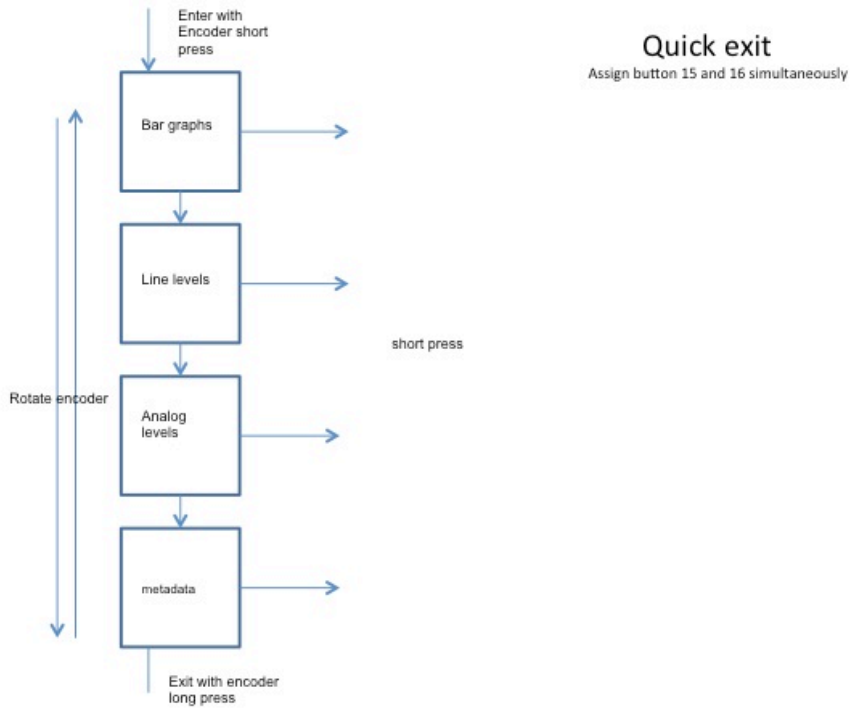
Tip: Simultaneously pressing the buttons under the bargraphs 7 and 8 will completely exit the menu.

The characteristics that can be adjusted in the menu are shown below.

Top level menu page

The top level of the menu carries the main areas of operation of the BM-A1-E16SHD that can be adjusted.

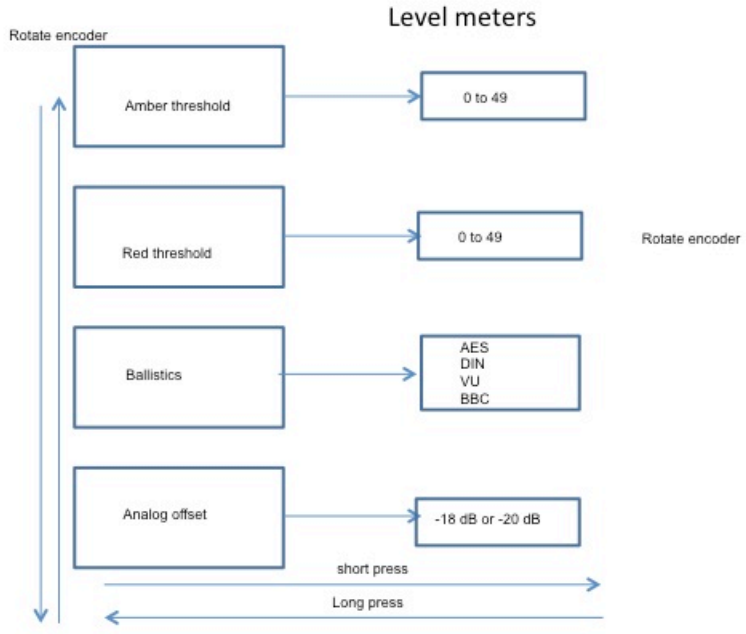
1. **Level meters** - This section allows access to the bargraph colour break points and ballistics.
2. **Line levels** - The line output level control can be selected here (either fixed level or controlled by the volume control). The line output can also be muted, or slaved to the main speaker mute control.
3. **Analogue levels** - The analogue output level control can be selected here (either fixed level or controlled by the volume control). The analogue output can also be muted, or slaved to the main speaker mute control.
4. **Dolby** – Various aspects of the Dolby operation can be accessed here.



Level Meter Adjustment

Various aspects of the audio level indication can be adjusted here.

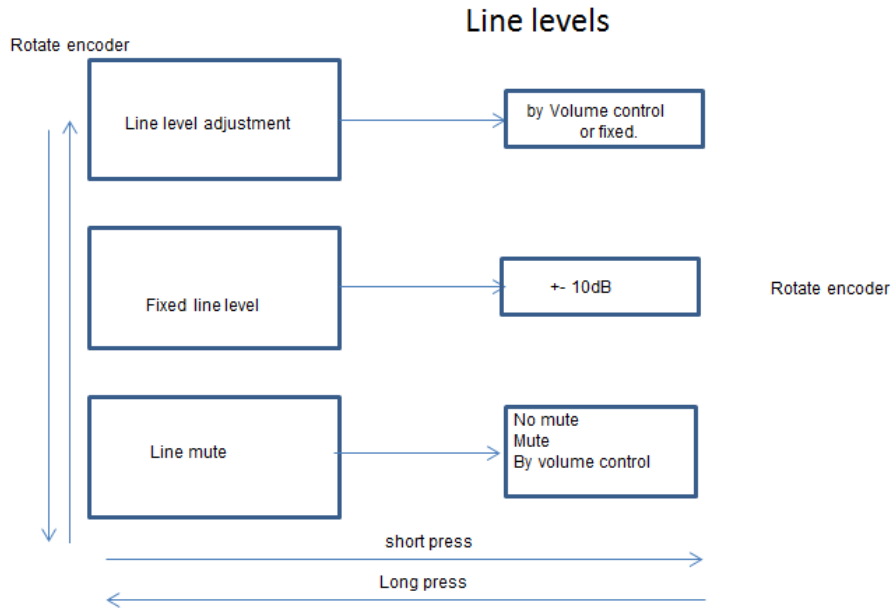
1. **Amber threshold** - The point at which the bargraph changes from green to amber can be adjusted here. Bargraph 16 is forced to full scale to allow easy control of the colour transitions.
2. **Red threshold** - The point at which the bargraph changes from amber to red can be adjusted here. Bargraph 16 is forced to full scale to allow easy control of the colour transitions.
3. **Ballistics** - The scales and dynamics of the bargraphs can be selected here. The options are AES, DIN, VU and BBC. The appropriate scales should be affixed to the front panel.
4. **Analogue offset** - When an analogue input is selected and the bargraph ballistics are AES the way in which this is displayed is adjusted here. If 0 dB analogue is applied to the unit the bargraph can be configured to show either -18 dB or -20 dB.



Line level output adjustment

The audio currently selected for the two front panel speakers is also available on two XLR connectors on the rear panel. The level of these can be adjusted from this menu.

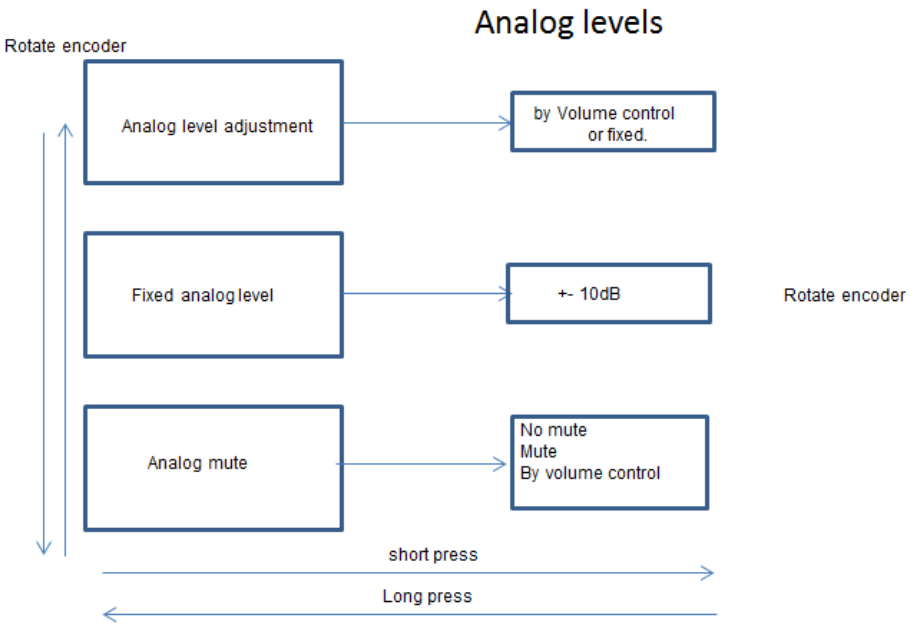
1. **Line level** - The line output level can be fixed or controlled by the front panel volume control and this can be selected here.
2. **Fixed line level** - When fixed output level is selected its level can be adjusted here.
3. **Line mute** - The line outputs can be muted here or the mute can be slaved to the front panel volume control.



Analogue output level

The audio currently showing on the 8 bargraphs are directed to 8 analogue outputs on a 25-way 'D' connector on the rear panel. The level of these can be adjusted here.

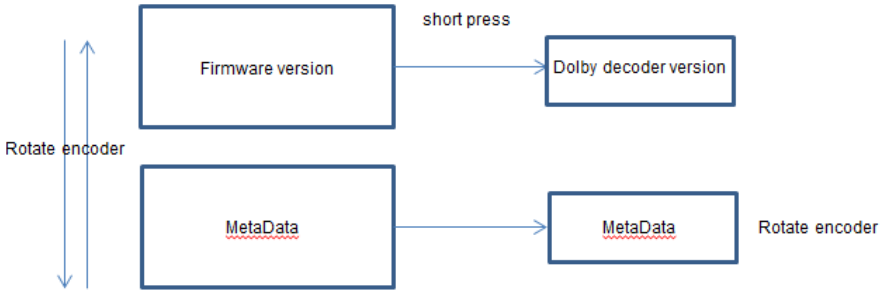
1. **Analogue level control** - The analogue output level can be fixed or controlled by the front panel volume control from here.
2. **Fixed analogue output level** - When fixed analogue output level is selected, its level can be adjusted here.
3. **Analogue output mute** - The analogue outputs can be muted here or the mute can be slaved to the front panel volume control.



Dolby Information

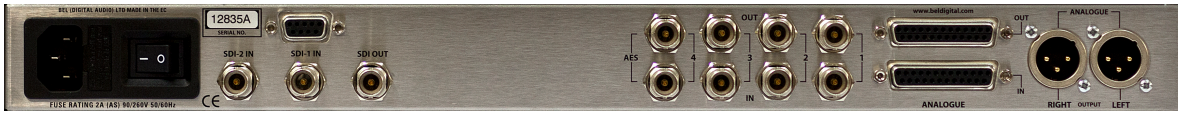
The firmware version of the Dolby decoder card and MetaData information can be accessed from this menu.

Dolby information



Installation

The BM-A1-E16SHD is designed to be installed in 19" bays on an equipment tray. Ventilation is by natural convection.



Analogue audio inputs and outputs

n	Description
1	A 1+
2	A 1-
3	GND
4	A 2+
5	A 2-
6	GND
7	A 3+
8	A 3-
9	GND
10	A 4+
11	A 4-
12	GND
13	GND
14	GND
15	A 5+
16	A 5-
17	GND
18	A 6+
19	A 6-
20	GND
21	A 7+
22	A 7-
23	GND
24	A 8+
25	A 8-

Specifications

Audio inputs

Digital	AES3-id 4 x 75 ohm (BNC connector). Sample rate 44.1/48 kHz.
Analogue	8 differential (25-way 'D' connector). Clipping +15 dB

Audio outputs

Digital	AES3-id 4x 75 ohm (BNC connector) sample rate 48 kHz.
Analogue	8 differential audio channels, level adjustable (25-way 'D' connector).
Line output	Copy of speaker outputs, level adjustable on 2 x XLR3M connectors.
Analogue noise	Noise+THD: -108 dB w.r.t clipping
Analogue frequency response:	20 Hz to 20 kHz ±1dB

Video inputs

Video format	SDI SD, HD or 3G

Video output

1 SDI active loop-through (BNC connector).

Main drive amp

Noise +THD -80dB w.r.t. maximum output.

Speaker driver units

Peak acoustic level (@2ft)	100 dB SPL
Shielding	Magnetic

Meters

8 tri-colour LED bargraphs with adjustable colour break points and ballistics.

DIN PPM: Overall dynamic range: 55 dB (+5 to -50 dB)
Attack time: 10 mSec
Fallback: 1.5 Sec per 20 dB decay

BBC PPM: Overall dynamic range: (+12 to-12 dB from mark 7 to mark 1)
Attack time: 10 mSec
Fallback: 2.85 Sec (from mark 7 to mark 1)

VU: Overall dynamic range: 23 dB (+3 to -20 dB)
Attack time: 300 mSec
Fallback: 300 mSec

AES/EBU: Overall dynamic range: 60 dB (0 to -60 dB)
Attack time: 1 mSec
Fallback: 1.5 Sec per 20 dB decay

Dimensions

19” Rack Mount: 1U high.
Outline Dimensions: 483 mm(W) x 256 mm(D) x 44.3 mm(H)
Outline Dimensions: 19 inch(W) x 10 inch(D) x 1.75 inch(H)

Environmental

Temperature 0° C to 30° C Humidity 70% max (non-condensing)

Weight

6 kg (14lbs)